SECTION VII - NED BENEFIT EVALUATION PROCEDURES: TRANSPORTATION DEEP-DRAFT NAVIGATION

6-74. Purpose. This section presents the procedure for measuring the beneficial contributions to national economic development (NED) associated with the deep-draft navigation features of water resources plans and projects. Deep-draft navigation features include construction of new harbors and channels and improvements to existing or natural harbors on the sea coasts to meet the requirements of ocean-going and Great Lakes shipping. Harbor improvements include such structural projects as the construction of breakwaters and jetties to protect exposed harbors and the provision of entrance channels, interior channels, turning basins, and anchorage areas. Nonstructural deep-draft measures include improved traffic management and pilotage regulations.

6-75. Conceptual Basis. The basic economic benefits from navigation management and development plans are the reduction in the value of resources required to transport commodities and the increase in the value of output for goods and services. Specific transportation savings may result from the use of larger vessels, more efficient use of large vessels, more efficient use of existing vessels, reductions in transit time, lower cargo handling and tug assistance costs, reduced interest and storage costs such as from an extended navigation season, and the use of water transportation rather than an alternative land mode. Principal direct benefits are categorized as follows:

a. Cost Reduction Benefits. If there is no change in either the origin or destination of a commodity, the benefit is the reduction in transportation costs of quantities of the commodity that would move with and without the plan resulting from the proposed improvement. Cost reduction benefits apply in the following situations:

(1) Same commodity, origin-destination, and harbor. This situation occurs where commodities now move or are expected to move via a given harbor or without the proposed improvement.

(2) Same commodity, and origin-destination, different harbor. This situation occurs where commodities that are now moving or are expected to move via alternative harbors without the proposed improvement would, with the proposed plan, be diverted through the subject harbor. Cost reduction benefits from a proposed plan apply to both new and existing harbors and channels.

(3) Same commodity and origin-destination, different mode. This situation occurs where commodities that are now moving or are expected to move via alternative land modes without the proposed improvement would, with the proposed plan, be diverted through the subject harbor or channel. Cost reduction benefits from a proposed plan apply to both new and existing harbors and channels. Compute cost reduction benefits for alternate modes in accordance with Section VI (See paragraph 6-59e).

b. Shift of Origin Benefits. If there is a change in the origin of a commodity as a result of a proposed plan but no change in destination, the benefit is the reduction in the total cost of producing and transporting quantities of the commodity that would move with and without the plan.

c. Shift of Destination Benefits. If there is a change in destination of a commodity as a result of a proposed plan but no change in origin, the benefit is the change in net revenue to the producer for quantities that would move with and without the plan.

d. Induced Movement Benefits. If a commodity or additional quantities of a commodity are produced and consumed as the result of lowered transportation costs, the benefit is the value of the delivered commodity less production and transportation costs. More precisely, the benefit of each increment of induced production and consumption is the difference between the cost of transportation via the proposed improvement and the maximum cost the shipper would be willing to pay. Where data are available, estimate benefits for various increments of induced movement. In the absence of such data, the expected average transportation costs that could be borne by the induced traffic may be assumed to be half way between the highest and lowest costs at which any part of the induced traffic would move.

6-76. Planning Setting. The planning setting consists of the physical, economic, and policy conditions that influence and are influenced by a proposed plan or project over the planning period. The planning setting is defined in terms of a without project condition and with project condition.

a. Without Project Condition. The without project condition is the most likely condition expected to exist over the planning period in the absence of a plan, including any known change in law or public policy. It provides the basis for estimating benefits for alternative with project conditions. Assumptions specific to the study should be stated and supported. The basic assumptions for all studies are:

(1) Nonstructural measures within the authority and ability of port agencies, other public agencies, and the transportation industry determine changes that are likely to occur. These measures consist of reasonably expected changes in management and use of existing vessels and facilities on land and water. Examples are lightering, tug assistance, use of favorable tides, split deliveries, topping-off, alternative modes and ports, and transshipment facilities.

(2) Alternative harbor and channel improvements available to the transportation industry over the planning period include those in place and under construction at the time of the study and those authorized projects that can reasonably be expected to be in place over the planning period.

(3) Authorized operation and maintenance is assumed to be performed in the harbors and channels over the period of analysis unless clear evidence is available that maintenance of the project is unjustified.

(4) In projecting commodity movements involving intermodal movements, sufficient capacity of the hinterland transportation and related facilities, including port facilities, is assumed unless there are substantive data to the contrary.

(5) A reasonable attempt should be made to reflect advancing technology affecting the transportation industry over the period of analysis. However, the benefits from improved technology should not be credited to the navigation improvement if the technological change would occur both with and without the plan.

b. With Project Condition.

(1) The with project condition is the one expected to exist over the period of analysis if a project is undertaken. Describe the with project condition for each alternative plan. Since benefits attributable to each alternative will generally be equal to the difference in the total transportation costs with and without the project, the assumptions stated for he without project condition are used to establish the with project condition for each alternative.

(2) Management practices that are sometimes within the discretion of a public entity and are therefore subject to change in the with condition include traffic management, pilotage regulations, addition of berths, and additions or modifications to terminal facilities.

c. Display. In the planning report, present the derivation and selection of with and without project conditions in accordance with the following guidelines:

(1) State the assumptions specific to the study.

(2) Specify the significant technical, economic, environmental, social, and other elements of the planning setting to be projected over the period of analysis. Discuss the rationale for selecting these elements.

(3) Present the with and without project conditions in appropriate tabular and graphic displays with respect to the elements selected as in paragraph 6-76c(2) and as exemplified by Tables 6-18, 6-20, and 6-21.

6-77. Evaluation Procedures: General. Use the following steps to estimate navigation benefits. The level of effort expended on each step depends upon the nature of the proposed improvement, the state-of-the-art for accurately refining the estimate, and the sensitivity of project formulation and evaluation to further refinement. A flow chart of navigation evaluation procedures is shown in Figure 6-6.

6-78. Evaluation Procedure: Step 1--Determine the Economic Study Area. Delineate the economic study area that is tributary to the proposed harbor and channel improvement. Assess the transportation network functionally related to the studied improvement, including the types and volumes of commodities being shipped, in order to determine the area that can be served more economically by the improvement. Include foreign origins and destinations in this assessment. Consider diversion from or to adjacent competitive harbors as well as distribution via competing modes of transport. It should be recognized that the lines of demarcation for the economic study area are not fixed and that the area may expand or contract as a result of innovations or technological advances in transportation and/or production or utilization of a particular commodity. The economic study area is likely to vary for different commodities. Combinations of economic areas will result in a trade area delineated specifically for the improvement under study. However, in many cases, due to the close proximity of adjacent harbors to the proposed improvement, the economic study area may be the same as, or overlap with, such adjacent harbors. Therefore, in the final delineation of the economic study area for a given improvement, there should be adequate discussion of the trade area relative to adjacent ports and any commonality that might exist.

6-79. Evaluation Procedure: Step 2--Identify Types and Volumes of Commodity Flow. To estimate the types and volumes of commodities that now move on the existing project or that may be attracted to the proposed improvement, analyze commerce that flows into and out of the economic study area. This analysis provides an estimate of gross potential cargo tonnage; the estimate is refined to give an estimate of prospective commerce that may reasonably be expected to use the harbor during the period of analysis in light of existing and prospective conditions. If benefits from economics of ship size are related to proposed deepening of the harbor, the analysis should concentrate on the specific commodities or types of shipments that will be affected. Thus, an historical summary of types and trends of commodity tonnage should be displayed. The considerations generally involved in estimating current volumes of prospective commerce are:

a. If the plan consists of further improvements to an existing project, statistics on current waterborne commerce will provide the basis for evaluation. For new harbors with no existing traffic, or for existing commodity movements that may be susceptible to diversion from adjacent harbors, basic information is collected by means of personal interviews or questionnaires sent to shippers and receivers throughout the economic study area. Secondary commercial data are usually available through State and local public agencies, port records, and transportation carriers. In the case of new movements, give attention of resource and market analyses.

b. After determining the types and volumes of commodities currently moving or expected to move in the economic study area, it is necessary to obtain origins, destinations, and vessel itineraries in order to analyze the commodity types and volumes that are expected to benefit from the proposed improvement. Commodities that are now moving without the project but would shift origins or

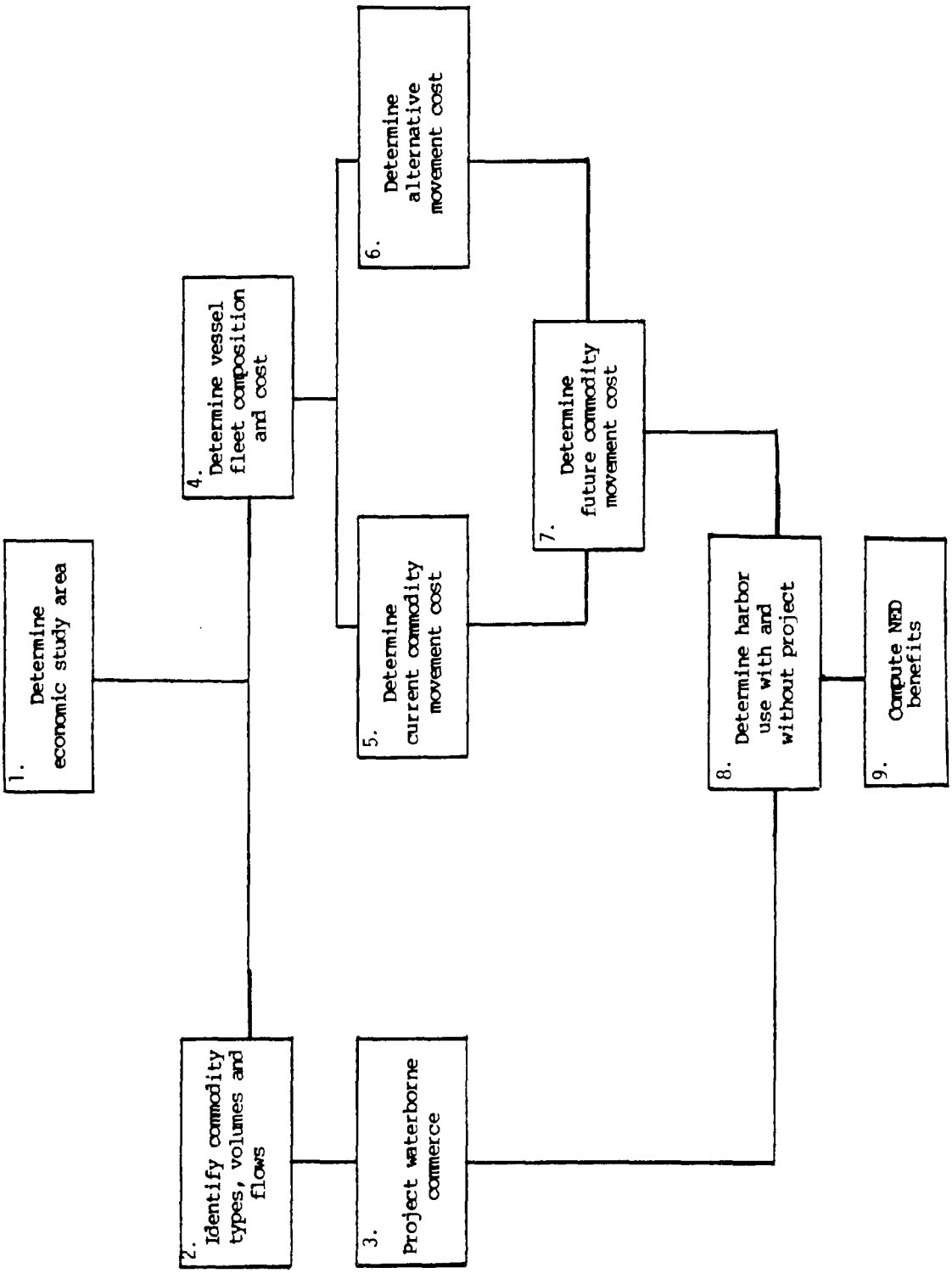

Figure 6-6. Flowchart of Deep-Draft Navigation Benefit Evaluation Procedures

destinations with the project, as well as induced movements, should be segregated for additional analysis (see steps 5 and 6). A study should be made of variousalternatives for the existing traffic and of new traffic susceptible to diversion from alternative harbors or other modes of transportation. The objective of such a study is to determine the type and volume of those commodities for which savings could be affected by movement via a proposed navigation improvement and the likelihood that such movements would occur. Cost reduction benefits sufficient to divert traffic from established distribution patterns and trade routes are navigation project benefits. In determining the likelihood of prospective commerce, particular attention should be given to alternative competitive harbors in the case of new movements and to hinterland traffic. Elements of analysis of current tonnage include: size and type of vessel, annual volume of movements, frequency of movements, volume of individual shipments, adequacy of existing harbor and transportation facilities, rail and truck connections, and service considerations. Generally this prospective traffic is the aggregate of a large number of movements (origin-destination pairs) of may commodities; the benefit from the navigation project is the savings on the aggregate of these prospective movements.

6-80. Evaluation Procedure: Step 3--Project Waterborne Commerce. Develop projections of the potential use of the waterway under study for selected years from the time of the study until the end of the project life, over time intervals not to exceed 10 years. Document commodity projections for the commodity groups identified in step 2.

a. The usual procedure for constructing commodity projections is to relate the traffic base to some type of index over time. Indices can be constructed by many different methods, depending on the scope and complexity of the issue under consideration and availability of data and previous studies.

b. Generally, OBERS projections are the demographic framework within which commodity projections are made. There are many instances, however, in which a direct application of OBERS-derived indices is clearly inappropriate. Frequently, there are circumstances that distort the relationship between waterway flows and the economy described by OBERS. Even when total commodity flows can be adequately described through the use of indices derived from OBERS projections, factors such as increasing environmental concerns, changes in international relations and trade, resource depletion, and other factors, amy seriously alter the relationship between waterway commodity flows and the economy described by OBERS.

c. If problems of the type described in paragraph 6-79b are identified, undertake independent studies to ascertain the most appropriate method of projecting commodity flows. The assessment of available secondary data forms the basis of these independent studies. These data will assist in delineating the bounds on the rate of increase for waterway traffic, as well as facilitate a better understanding of the problem. Supplement these data with (1) interviews of relevant shippers, carriers, and port officials; (2) opinions of commodity consultants and experts; and (3) historical flow patterns. Commodity projects can then be constructed ont he basis of the results of the independent studies.

d. Generally, specific commodity studies are of limited value for projections beyond approximately 20 years. Given this limitation, it is preferable to extend the traffic projections to the end of project life through the use of general indices on a regional and industry basis. Such indices can be constructed from the OBERS projections or other generally accepted multi-industry and regional models. Describe projection methods selected in sufficient detail to permit a review of their technical adequacy.

(1) Sensitivity analysis of several levels of projections is used for the economic analysis. There may be a high level projection embodying optimistic assumptions and a low level projection based on assumptions of reduced expectations. The high and low projections should bracket the most foreseeable conditions. The third and fourth levels of projections can reflect the with- and without project conditions based on the most likely estimates of the future. If a proposed plan would not induce commodity growth, one level of projection may be shown for both the with and without project conditions. (See Chapter 5, Section I)

(2) The commodities included in the projections should be identified, if possible, according to the following waterborne modes: containerized, liquid bulk, dry bulk, break-bulk, etc. Projection-related variables include estimated value, density, and perishability. The commodities should also be categorized by imports, exports, domestic shipments, domestic receipts, and internal trade. Projected tonnages by trade areas both with and without the project should be displayed at least for the study year, the base year, fifth year, tenth year, and then by decades over the period of the analysis.

(3) Most projections of waterborne commerce are static estimates of dynamic events; therefore, the projections should be sufficiently current to support the report conclusions.

6-81. Evaluation Procedure: Step 4--Determine Vessel Fleet Composition and Cost.

a. Vessel Fleet Composition. Key components in the study of deep-draft harbor improvements are the size and characteristics of the vessels expected to use the project. Present data on past trends in vessel size and fleet composition, and on anticipated changes in fleet composition over the project life. Use estimates of future fleet consistent with domestic and world fleet trends. Undertake studies to the extent necessary to determine the appropriate vessel fleet. The assessment of available secondary data forms the basis of the independent studies. Data may be obtained from various sources including the U.S. Department of Transportation (Maritime Administration), trade journals, trade associations, shipbuilding companies, and vessel operating companies. Determine the composition of the current and future fleet that would utilize the subject harbor with and without the proposed improvement. Provide adequate lead time for anticipated changes in fleet composition for vessels that are currently a small part of the world fleet. Size selection may vary according to trade route, type of commodity, volume of traffic, canal restrictions, foreign port

depths, and lengths of haul. It may not be realistic to assume that the optimum size vessel is always available for charter; the preferred approach is a fleet concept that includes a range of vessels expected to call with and without the project. It is suggested that tabulations in the reports show composition of vessel fleets by deadweight tonnage for each type of vessel beginning with the current fleet and by decades through the period of analysis. Historical records of trips and drafts of vessels calling at the existing project should also be displayed.

b. Vessel Operating Costs. To estimate transportation costs, obtain deep-draft vessel operating costs for various types and classes of foreign and United States flag vessels expected to benefit from using the proposed improvement. Since vessel operating costs are not readily available from ocean carriers or from any central source, the Corps of Engineers, Water Resources Support Center, will develop and provide such costs on an annual basis for use in plan evaluation. Planners should determine to what extent these estimates of vessel costs must be modified to meet the needs of local conditions. Document and display selected vessel operating costs in the report.

6-82. Evaluation Procedure: Step 5--Determine Current Cost of Commodity Movements. Determine transportation costs prevailing at the time of the study for all tonnage identified in Step 2. Transportation costs include the full origin-to-destination cost, including necessary handling, transfer, storage, and other accessory charges. Construct costs for the with and without project condition. The without project condition is based on costs and conditions prevailing at the time of the study. Transportation costs with a plan reflect any efficiencies that can be reasonably expected, such as larger vessels, increased loads, reduction in transit time and delays (tides), etc. Use competitive rates, rather than costs, for competitive movements by land (See paragraphs 6-75a(3), 6-59e, and 6-66b). This concept also applies to Steps 6, 7, and 9 and elsewhere where a competitive movement by land is an alternative.

6-83. Evaluation Procedure: Step 6--Determine Current Cost of Alternative Movement. Determine transportation costs prevailing at the time of the study for all tonnage identified in Step 2 for alternative movements. THe cost includes the full origin-to-destination cost. Such alternatives include competitive harbors, lightering, lightening and topping-off operations, off-shore port facilities, transshipment terminals, pipelines, traffic management, pilotage regulations, and other modes of transportation. Consider competitive harbors with existing terminal facilities and sufficient capacities as possible alternatives for traffic originating in or destined to the hinterland beyond the confines of the harbor and for all other new commerce as well as all diverted traffic. Commerce with final origins and destinations within the confines of the study harbor is normally noncompetitive with other harbors and need not be considered for diversion unless unusual circumstances exist. Diversion of established commerce now moving through the existing harbor to or from the hinterland is dependent on many different cost and service factors; therefore, to ensure that all of these factors are included in the analysis, interviews, and consultations with shippers and receivers should be conducted prior to any

determination concerning diversion of traffic. Factors to be considered in the analysis include transportation costs for both inland and ocean movement, handling and transfer charges, available service and schedules, carrier connections, institutional arrangements, and other related factors. In addition, for commodities with shifts in origins and destinations, as well as for new movements, collect data on the value of the delivered product as well as production and transportation costs for shipments with the project. The specific data and method of collection will vary with the specific situation and the nature of the benefit.

6-84. Evaluation Procedure: Step 7--Determine Future Cost of Commodity Movements. Estimate relevant shipping costs during the period of analysis and future changes in the fleet composition, port delays, and port capacity under the with and without project conditions for each alternative improvement under study. Base future transportation costs on the vessel operating cost prevailing at the time of the study. Additional data may be needed to analyze the relationship between total volume and delay patterns and the port capacity for the with and without project conditions for each alternative. Changes in costs due to the project should be identified and separated from changes due to other factors.

6-85. Evaluation Procedure: Step 8--Determine Use of Harbor and Channel With and Without Project. At this point, the analyst will have a list of commodities that potentially might use the proposed improvement; potential tonnages of each commodity or commodity group; transportation costs for alternatives and for the proposed improvement; and present and future fleet composition with and without the proposed plan. To estimate the proposed harbor use over time, both with and without the project, compare costs, other than projects costs, for movements via the proposed plan and via each alternative. Analyze any changes in the cost functions and demand schedules in the current and future without condition and the current and future with condition. Conceptually, this step includes all factors that might influence a demand schedule. Determine the impact of uncertainty in the use of the harbor, the level of service provided, and existing and future inventories of vessels. Provide adequate lead time for adoption for vessels that are currently a small percentage of the world fleet.

6-86. Evaluation Procedure: Step 9--Compute NED Benefits. Once the tonnage moving with and without a plan is known and the cost via the proposed harbor and via each alternative are known, compute total NED navigation benefits will be computed using the applicable discount rate.

a. Cost Reduction Benefits.

(1) Traffic with same commodity, origin-destination, and harbor. For traffic now using the harbor or expected to use it, both with and without the proposed project, the transportation benefit is the difference between current and future transportation cost for the movement by the existing project (without project condition) and the cost with the proposed improvement (with project condition).

(2) Traffic with same origin-destination; different harbor. For commerce shifted to the proposed improvement from other harbors or alternatives, including future growth, the benefit is any reduction in current and future costs when movement via the proposed improvement is compared with each alternative.

(3) Traffic with same commodity and origin-destination, different mode. For commerce shifted to the proposed improvement from other modes, the benefit is any reduction in current and future costs to the producer or shipper. (See paragraph 6-75a(3) when movement via the proposed improvement is compared with each alternative.)

b. Shift of Origin Benefits. For commerce that originates at a new point because of the proposed improvement, the benefit is the difference between the total cost of producing and transporting the commodity to its destination with and without the plan.

c. Shift of Destination Benefits. For commerce that is destined to a new point because of the proposed improvement, the benefit is the difference in net revenues to producers with and without the plan.

d. Induced Movement Benefits. If a commodity or additional quantities of commodity are produced and consumed as a result of a plan, the benefit for each increment of induced production and consumption is the difference between the cost of transportation via the proposed improvement and the maximum cost the shipper would be willing to pay. To determine the maximum cost other shipper would be willing to pay, estimate how much of a price increase it would take to induce the producer to increase its output by each increment or how much of price decrease it would take to induce consumers to increase their consumption by each increment. In the absence of data suitable for incremental analysis, the expected average transportation costs that could be borne by the induced traffic may be assumed to be half way between the highest and lowest costs at which any part of the induced traffic would move.

6-87. Evaluation Procedure: Problems in Application.

a. Multiport Analysis. This procedure calls for a systematic determination of alternative routing possibilities, regional port analyses, and intermodal networks that may require the use of computer modelling techniques. The data needed for such a determination are often difficult to obtain; therefore, interviews with knowledgeable experts will often have to be relied upon.

b. Ultimate Origins and Destinations. The procedure calls for an analysis of full origin-destination costs to determine routings as well as to measure benefits in some instances. Problems will arise in determining the ultimate origins and destinations of commodities and in determining costs. Therefore, the analyst should attempt to shorten the analysis to the most relevant cost items.

c. Sensitivity Analysis. Guidance for addressing risk and uncertainty in the analysis is found in Supplement I to Chapter I. The uncertainty in the estimates of critical variables should be dealt with. These variables specifically related to deep-draft navigation may be traffic projections, especially foreign shipments, fleet composition, and cost of commodity movements.

d. Data Sources. The following discussion summarizes key data sources including problems in their use:

(1) Interviews. Collect data not available from secondary sources by personal interviews. (Use only interview forms approved by the Office of Management and Budget.) Display the questionnaire used and summary of responses in the project report in such a way that individual sources are not disclosed.

(2) Publications. Data concerning commerce in foreign trade, United States coastal shipping, and activities of U.S. flag vessels in foreign trade, together with limited data concerning the world fleet, are readily available from a number of Federal agencies, trade journals, and port publications. However, data concerning the foreign-flag fleet are often not regularly available in up-to-date form from sources in the United States. Principal governmental sources are the U.S.Army Corp of Engineers, the Maritime Administration and the Bureau of the Census. For more detailed background on world fleet trends, shipping outlooks, and vessel characteristics, available foreign literature must be carefully analyzed. A few of the available foreign ship registers and literature are listed below to illustrate the type of data available from foreign sources.

Lloyd's Register of Shipping, London (Annual).
The Tanker Register, H. B. Clarkson (Annual).
The Bulk Carrier Register, H. B. Clarkson (Annual).
Shipping Statistics and Economics (and special reports), H. P. Drewry, London (Weekly).
Fairplay International Shipping Journal (and special reports), London (Weekly).

6-88. Report and Display Procedures. Clear presentation of study results, as well as documentation of assumptions and steps in the analysis, will facilitate review of the report. The accompanying tables are suggested. The number of displays will depend on the complexity of the study.

Tables 6-18
Projected Vessel Fleet Size Distribution,[a]
Ft. Channel Plan
(by Percentage)

Vessel size (D.W.T.)	Current[b]	Percentage of tonnage					
		Base year c	Year 5	Year 10	Year 20	Year--	Year end
Total		With project					
Total		Without project					

[a] Size distribution projections should be made separately, as follows: 1. For foreign and U.S. flag fleets. 2. For vessel types. 3. For trade routes (where distances, constrictions or other circumstances indicated varying sized vessels fleets). 4. For year project plan.
[b] Study year.
[c] First year of project benefits.

Table 6-19
Typical Vessel Dimensions of Vessel Fleet
by Type and Deadweight Tonnage

Type	Vessel characteristics			
	DWT	Length	Beam	Draft, loaded

Tables 6-20
Projected Commerce for Deep-Draft Traffic

Commodity[1]	Current year[2]	Base Year[3]	Year 5	Year 10	Year 20	Year--	Year--	Year end	Average annual
				With project					
				Without project					

1 Commodities should be categorized by trade area.
2 Study year.
3 First year of project benefits.

Table 6-21
Projected Vessel Trips for Deep-Draft Traffic

Commodity[1]	Current year[2]	Base Year[3]	Year 5	Year 10	Year 20	Year--	Year--	Year end	Average annual
				With project					
				Without project					

1 Show projected vessel trips by type of vessel and total for project life.
2 Study year.
3 First year of project benefits.